

Approximate English equivalents in parentheses

Fig. 1. Drawing of an ergonomically designed workstation shows keyboard, document, and display unit arranged one behind the other. New standards

also recommend an adjustable table height when a workstation is used by more than one person.

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West Germany Beefs Up Its Electronic Office Laws

Starting Jan. 1, West German offices must comply with stringent design standards—standards that may well influence developing U.S. guidelines governing equipment and furniture ergonomics for worker safety and health

While the controversy over the safety issues that surround use of video display terminals (VDTs) in the office heats up among legislators and organized office workers in the United States, attention will surely be drawn to ZH 1/618, a set of comprehensive standards that are scheduled to go into effect in West Germany on January 1, 1985.

In the U.S., a number of states have bills pending, ready for legislative action. None has been passed to date, despite a push by activist groups. On the federal level, there is a possibility of a bill in about two years' time that would set guidelines to protect workers within electronics-intensive office environments.

As pointed out in past issues of *FACILITIES*, some groups in the U.S. oppose both state and federally legislated guidelines or standards. Their reasons: Industry should, and can, voluntarily regulate itself; not enough research exists upon which to draw up definitive guidelines. Several groups also express concern that if comprehensive research is not forthcoming, the federal government may adopt existing German standards, and that these standards may be less than ideal.

Thus, what is happening in West Germany may have far-reaching impact on future U.S. guidelines, whether legislated or voluntary.

Eleven environmental aspects addressed

West Germany's ZH 1/618, called "Safety Regulations for Display Work Places in the Office Sector," addresses 11 different aspects of equipment and environmental factors in detail. In addition, it calls for mandatory eye exams prior to working at VDTs and for follow-up exams. It also extends to "operation" of workplaces and methods of insuring that regulations are not only instituted, but also understood and used by workers and maintained by employers.

ZH 1/618 follows and supplements standards developed by DIN (*Deutsches Institut für Normung*) that cover more than 30 different aspects of office safety, from size of workstations to power installation.

The entire body of regulations, rules, and other measures that apply to office employers and employees in West Germany puts that country at the forefront of the office safety issue, although a smaller proportion of that country's total workforce works in offices than does in the United States.

Developed in 1980 by the Industrial Injuries Insurance Institute, ZH 1/618 takes change into account. It covers work spaces that use VDTs and other display devices (such as microfiche displays) as the predominant tool of the job function, and it includes recommendations in addition to rules and regulations.

Recommends dark characters on light ground

For example, it recognizes that current devices usually display light characters on a dark background. The reverse, dark characters on a light background, "is strongly recommended for future development." Yet detailed standards for contrast, luminance, and graphic display on existing light-on-dark display devices are set forth.

The contrast must range between three-to-one and 15-to-one; but a shorter range, of from six-to-one and ten-to-one, is recommended.

Background luminance cannot be less than ten candle-units of density per square meter (approximately two square yards). Although the CDm^2 measure is not directly translatable to footcandle or U.S. light lumens measures, the objective of this stipulation is to limit the degree of light/dark adaptation between surroundings and screen.

Characters on the screen cannot touch each other and their design must be "clear and unambiguous." All characters must be fully formed. Lower case descenders, such as in the letter "g," must descend below the type line. The character width of capital letters ought to be 70 percent of the character height, but it cannot be less than 50 percent of it.

In continuous text, small and capital letters must be used. The colors of characters must match, except in multicolor coding, where no more than six colors can be used, and red and blue cannot be among them.

Display must be flicker-free. The design of the devices should combat veiling reflections on the screen. Filters with coated surfaces are recommended, but spray coatings are not considered adequate.

The gloss of the display housing may range from half-matte to silky-matte. The size of the screen must be able to display "an adequate" amount of information; too little or too much for the task adds to eye strain.

Cathode ray tube (CRT) video display units must meet the requirements of the X-ray Protection Ordinance that applies to sources of radiation and must be marked.

Keyboards must detach from screens

As a rule, keyboards must be separate from the display device so that each component can be positioned for comfortable operation. Compact or portable units that don't have detachable keyboards may be used only for "unique and appropriate" applications.

The height of the keyboard, measured at the middle key row, cannot be more than 30 millimeters (about 1.2 inches), and the inclination of the keyfield must be less than 15 degrees. A palm rest must be provided for existing keyboard designs that are more than 30mm (1.2 inches) above the table surface. This palm rest must be as wide as the keyboard, from 50 to 100mm (2 to 4 inches) deep, and have an adjustable incline.

On the keyboard, as on the screen, dark symbols on a light background are preferred, and the finish keyboard surface may range from half-matte to silky-matte.

Work documents, from which information is keyed into the device, must be legible, with good contrast between characters and the paper, and with sharp character contours. Only good carbons or originals can be used; glossy paper or foil cannot.

Workspaces are to be equipped with document holders that are designed to meet four requirements: **1.** Flexibility, to permit workers to adapt them to both the work document and handling, such as initialing and correcting copy. **2.** Ad-

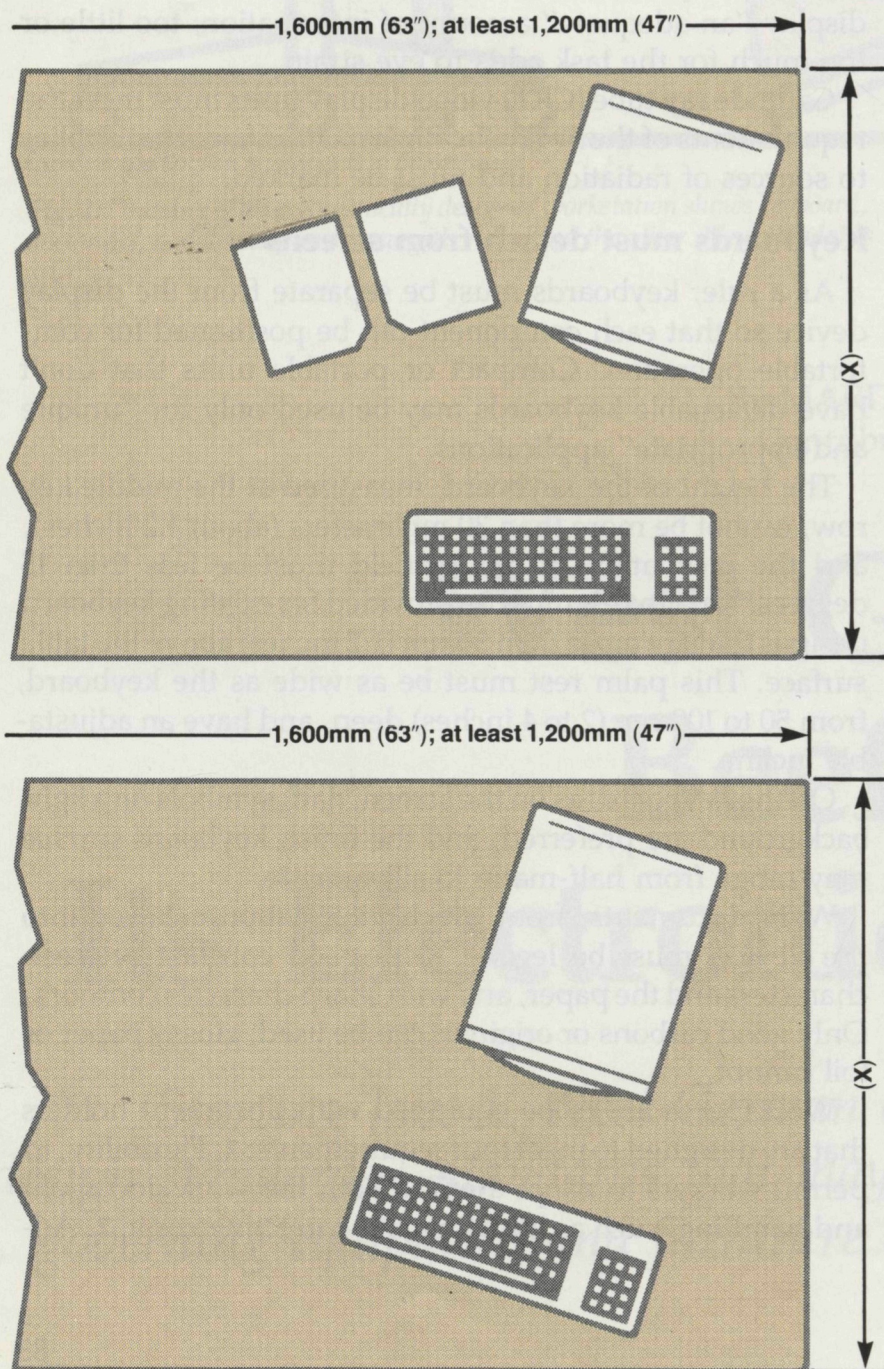
Germany's ZH 1/618 says that individual table lamps for added light are verboten

justability in slanting to prevent forced physical postures. 3. Proper size for the size of the work document. 4. Non-reflective, to eliminate problem glare.

Table surfaces must permit a flexible arrangement of the display device, keyboard, and work documents. For large-format or handwritten entries, the table top must be at least 1,200mm (about 47 inches) wide. An area of at least 600mm (about two feet) wide must be available in addition to the space occupied by the display unit and keyboard.

A surface 1,600mm (63 inches) wide overall is recommended, and it can consist of two table tops, side by side.

Tables must provide sufficient legroom, free from fixed built-in structures. Specifically, legroom must be 580mm (23 inches) wide. Its height at the front edge must be at least 650mm (25½ inches); 690mm (27.2 inches) is preferred.



Specifications for legroom height beyond the front edge are also included and delineated (see Fig. 1).

The depth of tabletops must allow a flexible arrangement of display device, keyboard, and document holder while maintaining the required viewing distance between the eyes and the screen, and leaving a space of from 50 to 100mm (two to four inches) in front of the keyboard for resting the palms.

Tabletop finishes must be between half-matte and silky-matte, without high levels of heat conductivity.

Adjustable tabletops are recommended when more than one person will be working at the workspace, and the range of adjustment is to be between 680 and 760mm (approximately 27 to 30 inches) high at the upper edge of the surface. Non-adjustable tables are to be 720mm (28.4 inches) high.

While the details of seating for display workspaces are delineated in another general regulation (ZH 1/535), this regulation calls for height-adjustable revolving chairs with footrests when they are necessary to meet the table-height seating specifications.

Three arrangements that meet the ergonomic requirements of tabletops for display workstations are illustrated in the regulations (see Fig. 2).

Requires precaution against glare, reflection

Height and incline of the display screen must accommodate comfortable use and avoid reflections. The optimum angle for head relaxation is an angle of 35 degrees below the horizontal line. When existing display devices do not permit this head angle while avoiding reflections, three options are specified (see Fig. 3 and 4). They cover the optimum field of vision, the maximum field of vision without head movement, and an extended level of vision that permits head movement.

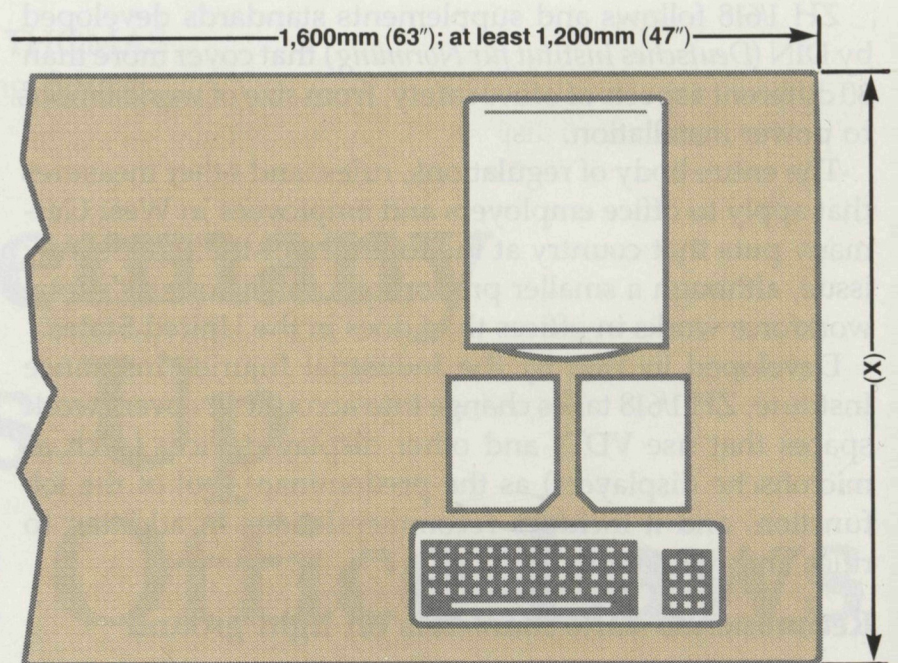


Fig. 2. Different arrangements of components on the work surface are recommended for specific tasks. Above left: for work with documents. Left: for dialogue with the visual display unit. Above: one-behind-the-other arrangement of keyboard, document, and display unit for word processing. Drawings are issued with documents explaining the new West German standards.

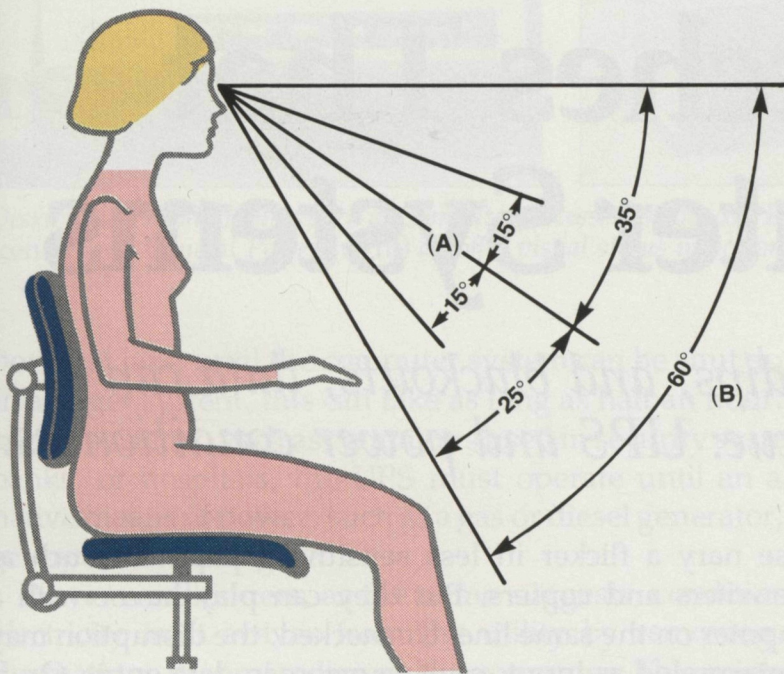


Fig. 3. Field of vision specifications limit the elevations where displays and materials can be located. **A** is the optimum field of vision; **B** is the maximum field of vision.

If workstations cannot be positioned to avoid glare from windows and other sources of reflection or glare, the negative influence of these environmental factors must be reduced by partition walls, curtains, or other forms of shielding. DIN, ZH 1/535, and a law regarding artificial lighting in the workspace dictate minimum office workstation illumination requirements, which are supplemented by the ZH 1/618 stipulation that individual illumination by table lamps must be avoided.

Individual lamps create unwanted heat as well as light. "The higher heat load generated by VDUs should be considered," and maximum heat loads for workspaces in general are specified in ZH 1/535.

Eyes must be examined by physician

Prior to working at a display workstation as a job function, a worker's eyes must be examined by an authorized physician, "if possible, an authorized company physician."

Corrections are to be made so that the person can read

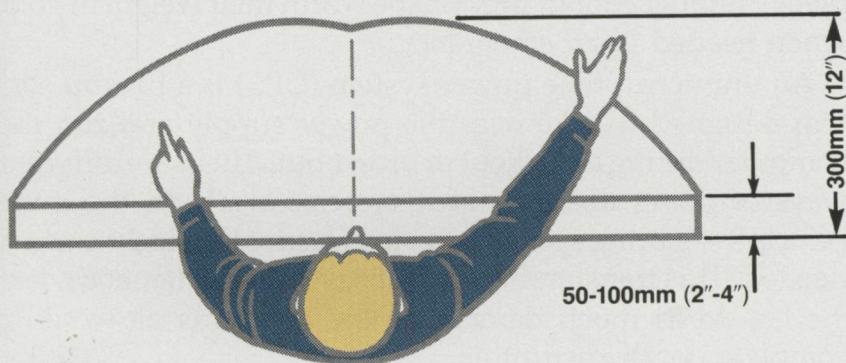


Fig. 5. Keyboard areas must be within the short range of reach. Front row of keys must be at a distance of 50 to 100mm (2 to 4 in.) from the front edge of the table.

without difficulty at a viewing distance of from 450 to 600mm (17.7 to 23½ inches). The preferred distance is 500mm (19.7 inches). Monofocal lenses are to be used for the correction, unless bifocals are required by special circumstance. Tinted and light-absorbing spectacles should not be used.

Follow-up exams are to be conducted every five years; every three years for people aged 45 or older.

Final section covers education, compliance

The five final pages of ZH 1/618 insure that all applicable regulations are understood, used, and maintained.

First, employees must be instructed about the optimum arrangements of work documents and equipment and the ergonomically correct adjustment of equipment and furnishings. Optimum arrangements of components are to be made, then checked regularly and adjusted in accommodation to fatigue or discomfort.

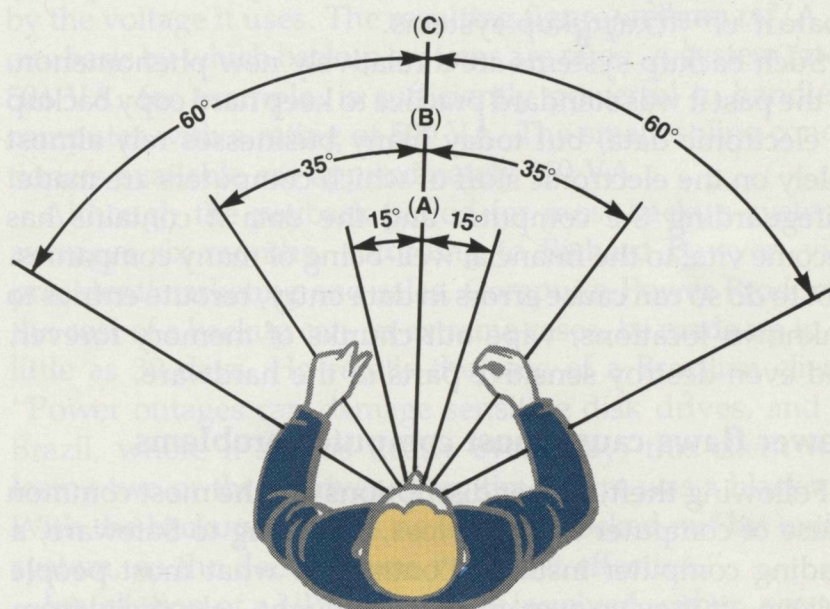


Fig. 4. In plan, specifications permit an extended field of vision (**C**) beyond the area of the workstation that can be seen without head movement.

Equipment that is used most frequently is to be placed in the central field of vision and within a specified short-range of reach (see Fig. 5). When processes and work content change, arrangement criteria are to be reviewed and adapted.

Display screens are to be cleaned regularly with cleaning agents that have been approved by the manufacturers of the VDTs.

Don't allow break-lumping

Work itself should be organized to allow for shorter and more frequent breaks, rather fewer, longer interruptions. It is recommended that employees not be permitted to combine the allowable number of short interruptions into fewer, longer ones.

Although these regulations became valid on January 1, 1981, strict compliance was not mandated until January 1, 1985, in order to give employers and the equipment manufacturers the opportunity to meet them. □